

## DESCRIPTION

### LOCKING DEVICE FOR A MOTOR VEHICLE

#### FIELD OF APPLICATION AND PRIOR ART

[001] The invention relates to a locking device for a motor vehicle, in which a projection acts on a holding part and the projection and holding part are movable relative to one another. In the sense of the present application, a locking device is also understood to mean an unlocking device.

[002] Such locking devices are e.g. known in the form of door locking systems for motor vehicles having a central locking system. Under the action of compressed air, a projection enters a recess of a holding part. This generally involves the insertion of a pin in a recess.

#### PROBLEM AND SOLUTION

[003] The object of the invention is to provide such a locking device permitting the automatic or simplified freeing or release of a holding part.

[004] This object is achieved by a locking device according to claim 1. Advantageous and preferred developments of the invention form the subject matter of the other claims and are described in further detail hereinafter. By express reference the wording of the claims is made into part of the content of the description.

[005] According to the invention a projection acts on a holding part and more particularly this takes place form-closed. The projection and the holding part are moved relative to one another in order to release the connection or engagement. Operating means are provided which move

the projection and holding part relative to one another in order to release the engagement. These operating means have an electromotive drive and a gear for transforming the drive movement. Thus, as a function of the operating means, the cover can be freed or released electrically and in quasi-remotely controlled or automated manner.

[006] The advantage of an electromotive drive compared with lifting or operating magnets known for similar objects or purposes is that in the case of lifting magnets larger operating paths are difficult to achieve and also magnets are relatively heavy.

[007] On the holding part can be provided a recess into which the projection is inserted or on which it acts. The recess can be a cutout open on one side, or alternatively a depression or breakthrough in the manner of an opening. The projection can e.g. pass into an opening in the manner of a pin.

[008] The drive can e.g. be constructed as a self-locking gear. This permits a type of automatic resetting, if this is desired. In one construction possibility for the gear, it can be provided with non-axially parallel toothed wheels or pinions. It can be a worm gear, advantageously a multiple worm gear. The latter can also be a non-self-locking gear.

[009] As a further possibility use can be made of a gear with a rack. The rack advantageously is connected to or moves the projection or holding part.

[010] The projection or the holding part can have both a form-closed holding position and also a release position for release purposes. This more particularly applies for the projection. An engagement advantageously occurs in at least one direction. In the other direction the hold-

ing part can optionally be moved freely away from the projection. There can alternatively be an engagement in both directions.

[011] It is possible to provide a freedom of movement of the projection and the holding part relative to one another in two opposing directions. In one direction, preferably for releasing the engagement, the movement can take place electromotively with the aid of operating means. Advantageously for the purpose of resetting the projection or restoring the engagement, a movement in the other direction can take place by a mechanical resetting, particularly with a spring or the like.

[012] Advantageously the projection is moved relative to the holding part, i.e. the projection itself moves. If the projection is constructed in movable manner, it can be in the form of a linearly operated rod or the like, which is inserted in the manner of a pin in an opening on the holding part.

[013] It is alternatively possible to construct the projection so as to rotate about a rotation axis. It is possible here to construct the projection so as to give way in one direction for securing the holding part. This means that by pressing the holding part against the projection, which can be simplified by a lateral bevel, the projection gives way and retains the holding part behind it. Thus, in practice the holding part can be firmly hooked behind the projection. It is also possible for the projection to release a guide, e.g. a longitudinal guide for the holding part.

[014] In a simplified development of the invention, it is possible to design the operating means in positionally secured manner and the projection in movable manner. Alternatively the operating means can be constructed movably together with the projection. For example, an electromotive drive can rotate with the gear about a toothed wheel or the like,

which is fixed in position. A projection can be connected to the drive and rotates in this way.

[015] In order to transfer the release force of the operating means to the holding part or projection, an actuating rod can be provided. The latter is movable and is e.g. in operative connection with the projection in such a way that the latter rotates or gives way through a longitudinal connection of the actuating rod.

[016] The operating means can be connected to a release device, e.g. to a sensor or switch. The release device can e.g. be located on a closure, a door or a tailgate of the boot or trunk and release the operating means. Thus, e.g. on opening the tailgate, there can be an automatic release and retraction of the projection and consequently a trunk cover or the like.

[017] With particular advantage such a locking device is used for a cover of a motor vehicle trunk. The cover can have a holding part and can be form-closed held in a holding position by the projection.

[018] It is possible for the cover to be freely movable. It advantageously runs with a holding part in a guide. The guide can in particular be provided on both sides of the trunk. For this purpose the cover can be provided with holding ends or an aforementioned terminating rod, which is guided in the guide. The projection advantageously engages in the guide. Here it is particularly advantageous if the projection is movable. For producing the engagement it can engage for this purpose in the guide. For releasing the cover, the projection can be moved out of the guide.

[019] In the holding position the cover is advantageously under a force action, e.g. a tension. If now the holder is released or the engagement

between the cover and projection is freed, the cover can move automatically. Such an automatic movement advantageously either takes place into another position or it is essentially a retraction of the cover for stowing.

[020] In addition to the engagement between cover and projection in one direction, the projection form-closed holds the cover in two directions along the guide. Thus, a movement of the cover overall can be avoided by the projection.

[021] A guide can be in particular provided on the rearmost roof support column of the motor vehicle. As a result, on opening a tailgate, the cover can be moved upwards therewith, so as to simultaneously free the trunk. However, this still does not release the cover in such a way that it can completely contract.

[022] The cover can be constructed as a flat article and have a substantially rigid rod at the end. Said rigid rod can substantially cover the entire width of the trunk, as well as the cover. On the rigid rod are e.g. provided the holding ends corresponding to the holding part.

[023] These and further features can be gathered from the claims, description and drawings and the individual features, both individually and in the form of subcombinations, can be implemented in an embodiment of the invention and other fields and can represent advantageous, independently protectable constructions for which protection is claimed here. The subdivision of the application into individual sections and the subheadings in no way restricts the general validity of the statements made thereunder.

## BRIEF DESCRIPTION OF THE DRAWINGS

[024] Embodiments of the invention are described in greater detail hereinafter relative to the diagrammatic drawings, wherein show:

- Fig. 1      A view of a cover in a guide, which is held by a projection movable by the operating means.
- Fig. 2      A variant of the view of fig. 1 with a longitudinally movable projection.
- Fig. 3      A detail representation of a guide with a projection movable by operating means and in which the projection is longitudinally movable.
- Fig. 4      A variant of the device of fig. 3 with a different construction of the operating means, as well as a projection twice pivotable on a toothed wheel.
- Fig. 5      An oblique view of a car trunk with a cover movable in a guide and which can be secured and released by a projection together with operating means.

## DETAILED DESCRIPTION OF THE EMBODIMENTS

[025] Fig. 1, which like the remaining drawings is to be understood diagrammatically and which shows the principle of the invention, reveals a holding device 11a for an end rod 13a of a not shown cover 12. The holding device 11a essentially comprises a locking device according to the invention.

[026] The end rod 13a is movable in a longitudinal guide 15a and can in particular be moved backwards and forwards. It can be held in the holding position shown in fig. 1 by a projection 17a and movement thereof is

prevented. For this purpose the projection 17a has a left-hand prong 18a and a right-hand prong 19a. Between the two said prongs 18a and 19a is held the end rod 13a and prevented from moving in both directions along the longitudinal guide 15. The projection 17a is rotatable about the fulcrum 20a.

[027] As can be seen, through the slight bevel of the left-hand prong 18a to the upper left, during a movement of the end rod 13a from the left the projection 17a is constructed movably so as to give way. Thus, through manual movement, the end rod 13a can be held on the projection 17a or introduced between the prongs 18a and 19a.

[028] Fig. 1 also shows that operating means 23a are provided for moving the projection 17a and have an electric drive motor 24a and a gear 26a. The gear 26a comprises a worm wheel 27a on the motor axis. It engages in a counterwheel or counterpart 28a, which performs a transitory movement. The counterpart 28a is connected to a release rod 31a guided in a guide 32a.

[029] Through the longitudinal movement of the counterpart 28a, the release rod 31a is movable against the sliding edge 35a of the projection 17a, so that it can pivot the projection 17a clockwise for releasing the end rod 13a.

[030] There is also a return spring 34a for the counterpart 28 or release rod 31a. In this case the return spring 34a is positioned between the guide 32a and the counterpart 38a. If the drive motor 24a is no longer rotating or exerting no force, the return spring 34 forces the counterpart 28a to the right again. As the gear 26a does not have a self-locking construction, the worm wheel 27 and the drive shaft of the drive motor 24a rotate and the counterpart 28a cannot give way to the right. Thus, the release rod 31 also moves to the right and the projection 17a is

again free. It is also possible to return the projection 17a to the position shown in fig. 1 by another spring.

[031] Fig. 1 makes it clear to the expert how in a modified form constituted solely by the operating means 23a and the release rod as the projection according to the invention and the guide 32 as the holding part with a recess through which the release rod moves, it is possible to construct a locking device according to the invention in its simplest form. It would also be possible to move the release rod 31 to the right out of the guide 32, so that the guide 32 would be released. Thus, unlocking would take place and the guide 32 would be freely movable.

[032] Alternatively the gear 26a could be replaced by a toothed wheel or pinion as the power take-off on the electric motor 24a and a rack cooperating with said pinion. The rack drives a projection similar to the projection 17a in fig. 1. A spring is also provided for resetting purposes.

[033] The simplified view of fig. 2 shows, how a similarly constructed projection 17b with a left-hand prong 18b and a right-hand prong 19b is longitudinally displaceable instead of being constructed in such a way as to rotate about a fulcrum 20a in accordance with fig. 1. The longitudinal displaceability is provided by the operating means 23b. Fig. 2 does not precisely illustrate the operating means and this can be easily implemented in a modification of the operating means 23a of fig. 1 or the operating means 23c of fig. 3 or 23d of fig. 4. Only the return spring 34b is shown. This illustrates the fact that on introducing the end rod 13b into the longitudinal guide 15b, e.g. from the left over the bevelled left-hand prong 18b, the projection 17b is forced back again. It once again encloses the end rod 13b between the two prongs 18b and 19b and in this way secures the same.



[034] Fig. 3 shows a bent or curved guide 15c in place of straight longitudinal guides according to figs. 1 and 2. In a corresponding manner an end rod 13 can be displaced or moved within the same.

[035] In accordance with the operating principle of fig. 2, the projection 17c is movable in translatable manner. It in particular has a bevel pointing to the top right for the automatic locking of an end rod 13 from above in the guide 15c.

[036] The operating means 23c are constructed in such a way that the drive motor 24c rotates a worm wheel 27c. The worm wheel 27c is in engagement with the large counterwheel 28c, which is in turn connected to a small toothed wheel 29c. The small toothed wheel 29c engages in the rack 30c, which is so connected to the projection 17c that it draws the latter with it during a movement to the left or right.

[037] Here a return spring 34c is provided, which can allow an elastic movement to the left of the projection 17c, even in the case of a stationary rack 30c. This can e.g. be provided for forcing an end rod 13 behind the projection 17c and in order to automatically extend it again for retaining the end rod 13c. The insertion and removal of the projection 17c by means of the operating means 23c for releasing the end rod 13 could in this case take place by the operating means 13c or the drive motor 24c respectively.

[038] As can be gathered from fig. 3, the gear 26c has the worm wheel 27c, the two toothed wheels 28c, 29c and the rack 30c.

[039] The guide 15c can pass further upwards, much like the guide 15e of fig. 5. In the downwards direction it can be opened in the right-pointing end for introducing the end rod 13 of cover 12.

[040] In fig. 4 the guide 15d has the same construction as in fig. 3. However, the operating means 23d exclusively have toothed wheels and no worm wheels. The drive motor 24b carries a motor pinion 25d, which drives a large counterwheel 28d. The counterwheel 28d is connected to a small toothed wheel 29b, which in turn drives the large toothed wheel 37d. On the right hand side the projection 17d is fixed to the toothed wheel 37d by means of a second fulcrum 21d on which the projection 17d is mounted in rotary manner.

[041] In the case of a movement from above of an end rod 13d against the projection 17d, the latter can rotate about the second fulcrum 21d and pivot counter to the resistance of the second spring 38 and can free the guide for the end rod. Forced out by the second spring, the projection 17d automatically snaps out again behind the end rod 13.

[042] For releasing the guide 15d in the upwardly, right-sloping direction, by means of the drive motor 24d the large toothed wheel 37 is rotated counterclockwise about the fulcrum 20d. Therefore the projection 17d disappears from the guide 15d and frees the latter. The rotary movement of the large toothed wheel 37 can tension a return spring 34d, here constructed as a spiral spring. After switching off the drive motor 24d, through the tension of the return spring 34d the large toothed wheel 37 is again rotated counterclockwise. This advantageously takes place against a stop to such an extent that the projection 17d is in the position shown in fig. 4.

[043] It is stated overall in connection with figs. 1, 3 and 4 that through the choice of the transmission ratios of gears 26a to 26d, the operating force and speed of the projection 17a to 17d is determined. Advantageously all the gears are not self-locking, so that they are able to move under the action of the return spring 34.

[044] Fig. 5 in a view from the rear of a car trunk makes clear the construction of the cover 12 with end rod 13e. The cover 12 can be drawn into the roller box 14, e.g. a restoring spring. In this way the cover 12 and in particular the end rod 13e is constantly force-loaded towards the roller box 14.

[045] The end rod 13e runs in the longitudinal guide 15e, whose configuration roughly corresponds to that of the tail column. A holding device 11e is provided in the lower region of the longitudinal guide 15e and is provided with a projection 17e, which extends into the longitudinal guide 15e and in the position shown in dashed line form prevents the end rod 13e from moving upwards in the longitudinal guide 15e. The projection 17e is movable by means of operating means 23e, more particularly extractable from the longitudinal guide 15e.

[046] By means of a holding offset 40 belonging to the longitudinal guide 15e the end rod 13e is supported downwards in the position shown in dashed line form. If it is drawn upwards and rearwards, it is possible to overcome the holding offset 40 and the end rod 13e can be removed in downwardly and forwardly sloping manner out of the longitudinal guide 15e and can e.g. be completely countersunk into the roller box 14.

[047] After moving back the projection 17e the end rod 13e moves out of the dashed line position into the continuous line position. This movement takes place through the tension to which the cover 12 is exposed. During a movement along the longitudinal guide 15e in the forwards and upwards direction, the end rod 13e comes closer to the roller box 14. Thus, the tensioned cover can be moved by said tension in guide 15e.

[048] In an arrangement according to fig. 5 not shown sensor means can be provided for recording an opening of the tailgate. As a function

thereof a signal is emitted to the operating means 23e for retracting the projection 17e and bringing about a movement of the cover 12. This can e.g. serve to automatically move the cover on opening the tailgate in such a way that the trunk is at least rendered partly freely accessible. In place of an upward movement, it is also conceivable to provide a longitudinal guide directly towards the roller box. Then on releasing the end rod 13 through projection 17, the cover can be completely and automatically drawn into the roller box 14. On closing the tailgate, the cover is then manually secured behind the projection 17, if this is desired.

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